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LABORATORY WORK IN SCHOOLS AND COLLEGES. FROM THE STANDPOINT OF A ZOOLOGIST.

'The system now in use in our high schools is all wrong.' So spoke, recently, a prominent educator in Oregon. 'Parents,' he continued, 'are giving up each year more and more of the oversight they ought to give their child's education and putting the responsibility entirely upon the public schools. As it stands now, if a child leaving our schools is weak mentally, morally or physically, we, the teachers, are blamed, whereas we, in our turn, are obliged to put each and every student through a certain course of study without consideration as to the student's ability, temperament, character, or mental tendencies; they are forced through this public school curriculum, *willy nilly*, at the expense of individuality. Now, since parents are giving up home teaching, so invaluable in bringing out the best points in a child and encouraging him away from his weak points, and since this serious responsibility is placed upon the public schools, where numerous scholars and lack of time prevent proper attention being given to each one, what remedy is there for this individuality-destroying system which we now find in these institutions?'

The writer, overhearing, takes this text and opportunity to try to show the value of laboratory work in high schools as well as in colleges, hoping, however, that some educator in this state will supplement his rather brief treatment of laboratory work in high schools with more complete details of possibilities.

The value of laboratory work has been long appreciated in the universities of Germany and in all the advanced institutions of learning in America. This work means, in the case of zoölogy for instance, that each student taking that course must spend a large proportion of his or her time in the laboratory studying the structure or the physiology, or both, of certain typical, well-known animals. He must see with his own eyes, think with his own brain, do his own theorizing and draw his own conclusions *unaided*, independent of book or fellow scholar, and must show that his work is correct by neat original drawings and original descriptions. One animal finished, another from a different group is given and the student encouraged to describe the differences and resemblances between this animal and the previous one studied, and so on from the lower to the higher forms.

No one but an enthusiastic adherent to this teaching principle can appreciate the phenomena that appear in the cases of different students in this work. Some, so brilliant in recitation that they repeat pages, are almost complete failures; others though slower in committing text, have eyes and minds alert. It is a case where, frequently, 'the last shall be first and the first last.'

For this reason firmness is necessary on the part of the would-

be successful teacher; the weaker students must be obliged to stand on their own ground, they must learn to train their own powers of observation, exercise other mental gifts than that of memorizing, and become as far as possible as proficient in the laboratory as in the class room. We would not, by the above statement, wish to lay ourselves liable to the accusation of being in favor of abolishing text books; on the contrary we believe that the judicious use of good text books and reference books is a valuable adjunct to laboratory work. But, certainly, we only truly learn that which we make our own, part of ourselves, and many a book learned lesson and principle has faded from memory to give place to something actually seen.

A trained biologist in an eastern college, having charge of a zoological laboratory with which we were fortunately connected, rarely looked over his pupils' examination papers, 'for,' said he, 'by almost daily contact with each student, by observing their method of work, their faithfulness or the contrary, the accuracy or inaccuracy of their observations, I become conversant with their mental status and can grade them as they deserve'

The same principles of laboratory work, as above outlined for zoology, hold in physics, chemistry, geology, botany, household economics and other branches. Independent observation and thought is the keynote in them all.

As previously intimated, a student blind to the beauties of zoology (if the reader will pardon the conceit) profits from work in a zoological laboratory just so far as he acquires there habits of originality and independence in mental and manual work which will help him in after life. It has been the writer's experience and observation that many a student promising little at the beginnining of a laboratory course, has, by being held rigidly to the principle at stake, developed into a capable worker, pleasing and astonishing his teacher by bringing to the surface latent gifts not suspected to exist.

Advanced workers in zoology, botany, chemistry, etc., seek and find opportunities in our seaside laboratories and post-graduate universities to carry out their ambitions in the way of original research, but it is only those workers who have learned habits of independence in earlier training that can hope to rank with those from whose efforts come reports of wonderful discoveries which delight scientists and aid humanity.

It would be, indeed, a difficult and radical move to attempt to introduce into our high schools any such system as above outlined, and yet it would seem, to the writer, that a modification of the present system, coupled with laboratory methods to such an extent as to do away with a large proportion of the indiscriminate cramming, for such it is, now present in these institutions, might be possible. Laboratory work as now practiced in the best colleges and universities, is only a very much advanced kindergarten, for children of a larger growth; an oppor-

tunity for a student to develop his individuality under the immediate direction of a capable teacher.

The educational ladder which has its lowest rung in the kindergarten and its higher steps in the universities and among advanced thinkers, includes, not quite a third of the way up, the high school.

Why must there be, at this point, such a complete interruption of a system so well begun? Why can we not substitute charts, relief maps, models and modelling, specimens of anatomy and natural history, manikins and pictures, for a large part of our present text books, placing the work table in place of the desk and the machine-shop in the place of the class-room, and pay, further, more attention to physical culture, more attention to the health, morals and manners of such students than these branches now receive?

In the present state of school education here such a move looks radical, even to an enthusiast; yet a sentiment in this direction is already being felt in the most progressive schools of our older states, lessening, thereby, the desire on the part of well-to-do parents to cut short the high school training of their children and place them where they can get a broader and more just education.

In conclusion let us hope that the time is not far distant when the selfhood within us will get more of a chance to assert itself, when the natural gifts which now lie latent within us may be encouraged to kinetic force and originality may conquer parrotism.

F. L. Washburn.

ON ACCIDENTALLY INTRODUCED FORMS OF ANIMALS.

Illustrations of the way in which exotic species are accidentally introduced into a country, have at various times attracted my attention.

Some years ago one of the local papers, in an interior county of California, contained a paragraph giving an account of the discovery, by a resident of the place, of a small egg in a bunch of bananas. The egg, it was stated, subsequently hatched, and a *young alligator* made its appearance.

Of course the alligator conclusion was altogether absurd, and the mental picture of an alligator climbing a banana or any other kind of tree is highly amusing, unless the bunches of bananas in some parts of the world are considerate enough to come down and await the pleasure of Mrs. Alligator, etc., and afterward return to their proper places. It goes without saying that these large saurians do not climb trees or frequent tree-tops. Again, the eggs of these huge monsters are not small, but are about the size of a goose egg, though more cylindrical or elongated, and

are laid in the sand, as are those of the smaller allied forms generally, where they are hatched by the heat of sun, the same as the eggs of the turtles. The alleged alligator was simply a harmless lizard. I have found these small reptiles in Havana sugar, into which they had crawled, between the time of filling the boxes, in which this sugar is often packed, and the nailing on of the covers.

I remember of reading an item in a New York paper several years ago which gave an account of an Italian fruit vendor having been bitten by a tarantula. He was in the act of cutting a banana from a bunch on his stand when the insect, which was evidently hidden on the stalk of the bunch, stung him on the right thumb.

The peculiar arrangement of the stems of the banana, radiating in several series from a central stalk, and the clusters of the fruit being so compact, make an exceedingly favorable hiding place for small animals.

Not long ago the National Museum received a specimen of the peculiar slug Veronicella, which had been found by the giver in a bunch of bananas.

In 1866 or 1867 I received several examples of two different species of land shells belonging to the genera Bulimulus and Orthalicus, which were brought to San Francisco in a cargo of dye woods from the Gulf of California. The dyewoods had been hauled from the place where they were cut, and piled up near the embarcadero on the gulf shore, and afterward transferred to the vessel. These snails had crawled into the hollows and crevices of the wood, and were discovered when the cargo was unloaded and put on the wharf in San Francisco. When the sticks were thrown ashore the rough handling shook out the snail shells; many also were found in the hold of the vessel after the cargo was discharged. Though I obtained several specimens none of them were alive.

It may be presumed with some basis of probability that while in the majority of cases forms thus transported and introduced fail to gain a foothold 'and multiply and replenish the earth,' in these new regions, so far from their native haunts, where different environmental conditions exist, etc., yet, sometimes, occasionally, it is otherwise, and the stranger becomes acclimatized and established. That this is not an infrequent result in connection with the distribution of insect life, both in the mature and larval stages, is shown by the phenomenal appearance of some insect whose pestiferous habits forces the knowledge of its presence upon those who are damaged or annoyed by it, and who not only feel the habits or operations of the unwelcome alien deeply in their pockets, but are also stirred to the utmost limits of their wrath, by reason of their nearly fruitless efforts to circumvent its ravages.

An investigation of the effects of the disturbance of what may

be termed the faunal equilibrium that exists in Nature, by the intentional. incidental, or accidental interference of man, would prove to be not only an interesting and curious study in itself, but would show how intimately interwoven are the various forms of animal life, as well as animal and vegetable life, and further demonstrate the necessity of looking ahead to detect if possible what advantage or disadvantage may follow in the train of causes and effects, through the modification of the fauna of any region by the introduction and permanent addition of a new species, an exotic, strange and not to the region born. The rabbit pest in Australia is an appropriate illustration, where failing to look before the leap was made it has,to use an old-fashioned phrase,'cost a pretty penny,' and conspicuously indicates the practical value of a thorough and philosophical knowledge of natural history as related to 'the affairs of mankind." The absence of carnivorous predaceous animals in the faunal species of that region has simply, to use a common expression, made the rabbit ' master of the situation,' and it would seem as if it were likely to remain so.

Robert E. C. Stearns.

THE ORANGE FOR HEALTH, PLEASURE AND PROFIT.

The orange has well been called the Queen of Fruits; and is certainly deserving of that title in southern California. For more than a hundred years the orange has thrived in the genial climate with which we are favored, and throughout historic time this beautiful tree has paid tribute to mankind.

The history of the orange is intimately connected with romance and mythology, and not only has it been prized for its luscious fruit, but for its beauty of form, the fragrance of its blossoms, and other characteristics that commend it to the care of man.

The cultivation of the orange may be made profitable in any clime where the temperature does not fall below forty degrees F. in Winter. Seedlings are as a rule more hardy than grafted or budded stock, and are consequently to be preferred in the colder climates. Some varieties will easily stand a temperature that will prove destructive to others. The orange is now cultivated in most warm countries with success. California and Florida are the two states in the Union where they are most extensively planted, but Arizona and New Mexico give promise of taking a high rank in the production of this fruit. In all the Gulf States the orange is also planted to some extent, but usually more for ornament than for profit.

A deep, rich soil is required by the orange to insure a prolific yield of fruit and a vigorous growth to the tree. A stunted tree will not produce fine fruit. Yet, the orange tree is not very particular in regard to soil, but will grow luxuriantly in sand or very

inferior soils, if well manured and not stinted for water in the summer. The soil which it seems to take to most kindly, in southern California, is a reddish loam, consisting of disintegrated granite, such as forms a good proportion of our mesa lands near the coast. Some varieties will doubtless thrive better in the rich black loam of our larger valleys. The Japanese varieties are said to prefer a sandy or yellow clay loam, richly manured, in open ground or on a hillside, with a southeastern exposure. Valleys are colder and more liable to damaging frosts than the uplands, and therefore less adapted for orange planting. The soil should be kept moist, but not wet, as the tree will stand a considerable drouth.

The orange arrives at maturity at nine years or less from the seed. Seedlings will remain fruitful and profitable for over a hundred years, but grafted or budded trees are supposed to become unprofitable at half that age. The tree has been known to live and bear fruit for four hundred years, and a tree at Nice is said to be over six hundred years old. Some of the trees, planted over a century ago, around the missions of California are still living in spite of the neglect of fifty years. The experience of orange growers at Riverside, California, shows conclusively that an orange orchard may become profitable at four years. The navel orange will bear, under favorable circumstances, on an average two and one-half boxes per tree at four years from the nursery.

An orange grove of selected, carefully cultivated trees will yield a greater income, for the investment and current expenses, than almost any other horticultural industry. Unimproved orange lands, with water, at Riverside, California, are considered worth from $250 to $600 per acre, according to location, but in other sections can be bought at lower prices. The same lands improved are valued at $1,000 to $3,000 per acre, according to the size of the trees and other circumstances.

One hundred to one hundred and fifty trees may be planted to the acre, fifteen or twenty feet apart. Riverside orange growers generally prefer to plant twenty feet apart, as giving better and more lasting results. The expenses connected with cultivating an old orchard is estimated at not less than $35 annually, if properly cared for; and to secure the best results an expense of $25 additional per annum, for fertilizers, should be incurred. At present prices for California fruit an orchard five years old will yield from $200 to $400 per acre net. One box to the tree is a moderate estimate of the yield of the navel orange at the end of five years, and at the rate of one hundred trees to the acre the product would sell for $300 readily. At ten years of age an orchard will net as high as $1,000 to $1,500 to the acre. Such returns have actually been realized by more than one California orange grower, but $300 to $500 is probably nearer the average return to the producer. The industry, however, is still in its infancy.

The orange tree is commonly propagated in this country from the seed, and by grafting or budding. The tree can also be propagated from cuttings Seedlings are much more likely to produce fruit of a quality inferior to that of the parent tree, than fruit of an equal or superior quality; but the most of our superior varieties of oranges we owe to this tendency to sport. When a superior variety has been produced it is propagated by grafting or budding onto the roots of other seedlings. The Chinese have a curious method of propagating desirable varieties. 'A branch of the diameter of four or five inches is chosen, around which a circular incision is made. Around this straw matting is wound in the shape of a funnel, and filled with beaten earth. Roots soon begin to push, and by the following season it is provided with sufficient to support it when detached from the parent stem. The young tree thus obtained often bears fruit at the end of two or three years.'

Pruning of the orange tree is denounced by some growers, but the more experienced advocate the inteligent use of the shears, for the shaping of the tree,for the removal of dead wood, or branches growing in the wrong direction, projecting limbs or those touching the ground, and for the removal of the small branches and suckers which choke up the inside of the tree, excluding needed light and air, and forming dangerous places for the multiplying of injurious insects.

An ideal orange tree, at eight years of age, may be described as twelve feet high, symmetrical in shape, with limbs projecting evenly on all sides, about eight feet in diameter; of compact growth, the dense foliage hiding the larger limbs, and the trunk visible for about a foot above the ground. To secure an ideal tree some pruning is necessary at times, but should be very sparingly indulged in and not overdone. Too little is better than too much pruning. The early spring is conceded to be the best season of the year to do the heavy pruning. They may be lightly trimmed at other seasons as they need the attention.

The yield of the orange tree is very great. The usual yield is 600 to 1,000, sometimes, but rarely, as high as 6,000 to the tree. 'In Malta and Naples as many as 15,000 oranges have been picked from a single tree; in the Sandwich Islands a tree was estimated to bear 20,000 fruits; while 33,000 oranges have twice been reported from one tree in southern Europe!' The tree comes into bearing at three to five years of age from the seed, in some places arriving at maturity much earlier than in other countries. The yield at Riverside, California, per tree, in merchantable fruit, has been given as follows: Ninth year from seed, half box; tenth year, one to three boxes; eleventh year, one to five boxes; twelfth year, same; thirteenth year, three to five boxes; fifteenth year, six to eight boxes; with an average increase of a half box thereafter up to the twentieth year. The fruit has sold at from $1.40 per box on the tree, to $6 per box, according to quality and season.

The orange was highly esteemed by the ancients for its medicinal qualities—a fact which seems to be lost sight of by the present generation. In cases of fevers and malarial complaints this delicious fruit is more useful than drugs, and is often very helpful in alleviating the ills of mankind. A prominent physician once remarked that were his patients to eat an orange or two every morning, they would require but little medical attention.

In France immense quantities of orange blossoms are annually consumed in distilling orange-flower water. One firm alone is reported as using 350 tons of the flowers for this purpose in a single season. Tons also are candied green. Neroli, so much used by perfumers, is extracted from some varieties. Curacoa is manufactured from dried orange peel. The leaves are frequently used as a substitute for tea, in health as well as in cases of sickness. Thus, it will be seen, that the fruit is not the only useful product of this handsome evergreen tree.

Citrus aurantium is the botanical name of the orange of commerce but there are several other species now known, and hundreds of varieties are in cultivation. Among these varieties the following may be considered as having been received in California with the greatest favor, among growers for profit.

WASHINGTON NAVEL.—Originated in Bahia, Brazil. Generally considered the most profitable orange for the market, ripens early, commences to bear at one year from the bud, prolific, the fruit large, solid, heavy, skin smooth, of very fine texture. Fruit very juicy, highly flavored, with melting pulp sweet, seedless. The tree is a rapid grower, but does not attain to a large size.

MEDITERRANEAN SWEET.—One of the very best, introduced from the region of the Mediterranean sea, a regular and heavy bearer, ripens late, and generally very evenly. The tree grows to medium size, and thornless. Fruit medium to large, pulp and skin of very fine texture, solid, few seeded, richly colored deep orange. One of the most delicious of fruits, and well worth planting on a large scale.

TAHITI SEEDLING.—A large tree and a good bearer, one of the most profitable oranges grown after it comes into full bearing. Will yield twelve to fifteen boxes per tree when from fifteen to twenty-five years old. Fruit can be shipped the first of February, but can be left on the trees without injury until the first of June.

JOPPA.—A vigorous, thornless tree, from Palestine. Fruit large, firm, nearly seedless, rind thin, pulp very fine, sweet and juicy, of a deep red color. Can be marketed early or late without deterioration in quality. Not generally known. Some call it the Jaffa orange.

TANGERINE OR KID GLOVE.—A dwarf, symmetrical tree, of a weeping habit. Fruit small, deep red, very sweet and aromatic. The rind, when ripe, is very easily separated from the pulp, hence is called the "Kid Glove orange."

ST. MICHAEL.—The 'paper rind', is a small, round orange, very firm and juicy, and with very thin pale-colored skin. Ripens late, keeps well on the tree, and does not drop when mature. This orange is from the Azores. The tree is dwarf, and a prolific bearer. The Azorean St. Michael is a larger tree, a rapid grower and very prolific also. The fruit ripens early, keeps well on the tree, few seeded, larger than the 'paper rind' St. Michael, solid, flattened in shape. The pulp is fine and melting and the rind medium thin.

The Washington Navel, the Mediterranean Sweet, the Tahiti Seedling and the St. Michael are the four varieties which those of widest experience recommend most highly for extensive planting, as sure to be standard varieties in the market for years to come. Other varieties are either little known or more curious and ornamental than profitable.

Among the numerous varieties which have been tried or are being tested, the following are some most worthy of notice or most prominent. The descriptive notes of the above varieties and the following are freely compiled from various reliable sources, as the writer is not personally familiar with them all.

WOLFSKILL'S BEST.—Considered identical with the Tahiti Seedling.

KONAH.—Fruit large, rough and thick skin. Tree very thorny. Ripens early. Raised in California from seed grown in Konah Island, and has few, if any, good qualities to recommend it for cultivation.

KING.—A Chinese monstrosity; highly flavored, medium-sized fruit, with rough rind. Ripens late.

OONSHIU.—This Japanese dwarf is very hardy and ornamental, producing small, flattened fruit, of exceedingly fine texture, sweet and seedless, the rind easily detached. Wrongly called the Satsuma orange. Not likely to prove of any great commercial value. A prolific bearer, of a drooping, willowy habit, and very hardy, as was proved in Florida in the great freeze of 1886. Probably one of the most useful of the many varieties of Japanese oranges.

KUMQUAT.—The very small, oblong or olive-shaped fruit of this bushy tree is peculiar in being edible throughout—rind and all. The rind is thick, yellow, smooth, and sweet-scented. The pulp contains many seeds. Prolific, but more odd than useful, as there is very little pulp about the fruit. Other ornamental varieties are the following:

MANDARIN.—A very ornamental tree. Fruit red, flattened at the ends.

POMELO OR GRAPE FRUIT.—Fruit very large, from two to five pounds each in weight, pale yellow, resembling the citron. Skin smooth, juice sub-acid. A variety of shaddock.

SHADDOCK.—Tree dwarfish, ornamental. Fruit very large,

with smooth skin, pale yellow and very glossy. Rind thick and spongy and very bitter. Ornamental only.

BOUQUET.—The large and fragrant flowers are of commercial value, as also in the following species. Fruit very bitter.

BERGAMOT.—Fruit large and rough, flattened, ornamental only. Grown for the blossoms.

The oils of Neroli and Bergamot are expressed or distilled from orange blossoms. The fragrance of orange blossoms is very agreeable, and is thus utilized by perfumers. In the poetic language of flowers the orange blossom is the emblem of chastity, and is the recognized bridal flower among English speaking people.

The question as to whether there is danger of over-production is always to be heard in connection with any industry, long before the market is nearly supplied. Nearly five million bushels of oranges were imported into the United States in 1884. Southern California exported in 1890 nearly 3,000 carloads of this favorite fruit. The quality of our California oranges is recognized as superior to the product of Florida or of the foreign importations. That there is or ever will be any danger of an over-production of a fine quality of fruit need not be entertained for a moment. The product of the 6,000 acres under cultivation at Riverside, in 1890, realized for citrus fruits (oranges and lemons) one million dollars, and for raisins and other dried fruits half a million dollars—a handsome income for any community. While it cannot be hoped to maintain the present profits of orange culture for all time, yet no diminution need be feared for years to come, and the industry is likely to continue one of the most profitable among horticultural pursuits.

Success requires careful judgment in many directions. Of primary importance is the selection of the site of an orange orchard, with suitable soil. Care in the selection of the best trees is of second importance. The planting requires dexterity and careful management, and May is recommended by some as the best month in southern California for this work. Cultivation, irrigation and fertilizing are other subjects which demand attention—and the details of each of these subjects would each require a volume for their proper presentation. And last but not least is it desirable to be posted on the useful and injurious insects which aid or hinder the horticulturist as well as a knowledge of fungous or other diseases which may beset the orange. The orange, for health, pleasure and profit, however, can scarcely find a rival among the fruits of the earth. —*C. R. Orcutt.*

WALDEMAR G. KLEE.

W. G. Klee, late Inspector of the Agricultural Experimental Stations in California, died in the early part of February, of consumption, in his thirty-eighth year. He was born in Copenhagen,

Denmark, where he was educated in horticultural arts, and where his brothers and sisters still reside.

He came to America when about nineteen years of age, and secured employment in a public park in Chicago. About fifteen years ago he came to California. Attending the State University at Berkeley his ability was recognized by Prof. Hilgard, and he was given employment on the experimental grounds of that institution.

Mr. Klee was appointed to collect and arrange the living plants of California at the New Orleans Exposition, and made that feature a credit to the state. In 1886 he was appointed State Inspector of Fruit Pests by the State Board of Horticulture. In 1889 he was appointed Inspector of Experimental Stations in the state, which position he was later compelled to resign on account of his health.

The horticultural writings of W. G. Klee are widely and favorably known, and have mainly appeared in the reports of the University of California, of the State Board of Horticulture, and of the U. S. Department of Agriculture, aside from contributions to the horticultural press of the day.

In 1885 Mr. Klee married Miss Jennie Barry who, with three children, survives. His death occurred at his ranch near Santa Cruz, where he had retired in hopes of regaining his strength through an out-door life.

THE FOREST TREES OF OREGON.—II.

In the firs (Picea), the cones are upright, and in the distance they are sometimes mistaken for birds perched on the limbs.

PICEA GRANDIS or Western Balsam Fir, or Abies Grandis or Oregon White Fir is found at its best along the shores of the Willamette river and its tributaries, but is widely dispersed along the mountain slopes of both ranges. Its commercial value falls below that of several other trees. It is conspicuous along our river bottoms for hight and beauty. It is easily transplanted.

PICEA NOBILIS—Noble Fir. This fine fir is at home in places remote from mills and railroad lines, and therefore does not figure much in commerce. Extensive groves of it may be seen among the Coast mountains where prostrate trees 200 feet in length are not rare. As an ornamental tree it well deserves its name of noble, and it is easily transplanted. It also has a large handsome cone.

PICEA AMABILIS. Cones are dark purple. This, too, is out of the reach of commerce; abundant along the summit of the Cascade mountains. This is a very handsome tree for landscape gardening.

THUYA GIGANTEA—Western Arborvitæ. This is the white cedar of North Oregon and of Washington. It is a grand forest

tree; is durable, easily worked as finishing lumber and highly prized for its lightness. The northern Indians build their largest canoes of it and use its bark for mats and cordage. In the southern portion of the Willamette valley it is called the smooth-barked cedar, to distinguish it from Libocedrus.

LIBOCEDRUS DECURRENS—Rough-barked Cedar or Incense Cedar. As a tree for lumber this is inferior to the Thuya. It does not grow farther north than Lane county. It is abundant throughout Douglas and Jackson counties.

THE LAWSON CYPRESS—Port Orford Cedar (Chamaecyparis lawsoniana) is not found north of the Umpqua river. It is at its best around Coos Bay and the Coquille river and the north slopes of the Siskiyous. It is called white cedar; is shipped extensively for the California market. So completely marketable is this tree that one may see on the Coquille the finest example of lumber economy: The log is cut into boards and squared timber, the slabs into pieces for broom handles and lath, and the scraps into blocks for matches; and it deserves this fine economy of material. As a tree for landscape gardening it is questionable whether North America has a finer tree than the Port Orford cedar. It is at its best along the northern slopes of the Siskiyous. It is easily transplanted, will grow in a wide range of climate, and will teach any one to love a tree.

JUNIPERUS OCCIDENTALIS. In many of the dryer regions of Central Oregon this juniper, under the name of cedar, furnishes the chief and often the only supply of firewood. It is not abundant enough for extensive commercial demands. It strongly resembles the red cedar of the Eastern States (Juniperus virginianus).

JUNIPERUS COMMUNIS. A stranger to this species seeing it for the first time experiences marked surprise. It is entirely prostrate, often growing over a space 100 feet square, the stem five or six inches in thickness. One could readily imagine many situations in landscape gardening in which such a plant would fill a want. It is often met on the coast.

TAXUS BREVIFOLIA. The Oregon yew has a dense, durable wood, often used in western Oregon for fence posts. It is not abundant enough for commercial purposes. It is a handsome tree, pays for transplanting in the beauty it adds to a lawn.

LARIX OCCIDENTALIS.—Oregon or Western Larch. This is a much larger tree than the tamerack of the Eastern States. Its timber is good. It is at home along a belt of foothills from the Upper De Chutes north into Washington, and abundant in the Blue mountains but not in western Oregon. Excepting this larch, all the foregoing trees are evergreen.

We will now consider the deciduous trees that rank as valuable for shade or ornament as for commerce. Oregon has three oaks that are of commercial importance. Of these in abundance and quality, the Oregon white oak ranks first.

QUERCUS GARRYANA (Oregon White Oak). This seems at its best in the Willamette valley and along the Columbia river. For years past a large amount of this timber has been shipped to San Francisco, and well authenticated cases have occurred of its being returned to Oregon as Eastern oak for our wagon builders.

QUERCUS KELLOGGII—Black Oak—Kellogg's Oak. This handsome oak is found no further north than Lane county, but grows abundant in southern Oregon. I have not seen it in central Oregon. It is at its best in Douglas and Jackson counties. It is a much handsomer tree than the white oak, but its timber is not so good.

LIVE OAK—Quercus chrysolepis. This tree is often used for wagon timber along the western slopes of the Siskiyous but is scarcely abundant enough to more than supply home want.

Thomas Conaon.

REMARKS UPON THE STENINI OBSERVED IN SAN DIEGO COUNTY, CALIFORNIA.

Among the Microcoleoptera, neglected by the majority of collectors, is that extremely interesting tribe of the Staphylinidæ—the Stenini. The insects of this group are generally minute, varying between 1.7 mm. (Stenus atomarius) and 5.5 mm. (Areus annularis).

They are to be sought for about the roots of plants; beneath decaying vegetable matter, and debris cast up by the water, along creek and river banks. They are generally abundant about all permanently moist places. Rarely have I taken them on the wing.

They are readily recognized by their dark color, Mantis-like attitude, prominent eyes, abdomen decreasing rapidly in width from base to apex, and by their peculiar movements—running with varying speed in the different species, for short or long distances, then pausing for a time.

They are said to be carnivorous in their habits, and my observations thus far confirm that statement; but not by abundant proof. On one occasion while searching about the roots of a partly broken down shrub, I discovered one with a small green aphid in its jaws, that I had probably dislodged while disturbing the plant.

The species thus far collected in San Diego county are four in number, but they are by no means the sum total of those that can be taken. They can be collected from May to December, but are most abundant during the months of June, July, and August. The species are as follows:

STENUS SCULPTIL, IS Casey.—A distinct form, and varying in length from 3.9 mm. to 5.2 mm. Decidedly robust. Pubescence

on abdomen visible, giving a silvery and fulvous ornamentation. Surface of prothorax and elytra, rough. The transverse tricuspid carinæ of abdomen distinct. This species is readily differentiated from any of its congeneric associates. It is abundant at Poway (elevation 700 feet), and I have not taken this form elsewhere, although its geographical distribution is quite extensive, occurring in Washington, Oregon, Nevada, and northern Lower California.

STENUS PACIFICUS, Casey.—At first glance this species closely resembles S. arizonæ, but a careful examination and comparison cannot fail to readily distinguish between the two. In length it varies from 2.2 mm. to 3.0 mm. In form, moderately slender. Pubescence not appreciable. Prothorax is narrower than long, with anterior and posterior margins equal. Prothorax and elytra irregularly and moderately punctured. Surface polished. Taken along the San Diego River in considerable numbers. I have not taken this species at Poway, yet it may occur there. At the present state of our knowledge of its distribution it appears to be peculiar to Southern California.

STENUS ARIZONÆ, Casey. — More robust than the preceding species. Length, 3.0 to 4.2 mm. Prothorax wider with margins strongly arcuate. The traces of channels upon pronotum and elytra aid greatly in separating this species. Abundant along the San Diego River, in company with S. pacificus, and is recognized by its darker color—surface not being polished. These two species *seem* to be the characteristic species of the coast region, not having found them in company with the species of the interior. Probably it is irregularly distributed, for it occurs in Arizona and Texas.

AREUS PINGUIS, Casey.—I have found this species associated with S. sculptilis in the Poway region. Very robust in form. Contrasting strongly with its associate species by its fine, closely placed, and evenly distributed punctures. In length this species varies but little, being close to 4.0 mm. in all specimens measured. Distributed over an extensive area; according to Thos. L. Casey, it occurs in British Columbia, Washington, Oregon, Nevada, Colorado, besides California.

The consideration of the local distribution of species that have such an extensive range, may seem unprofitable, but as a species may be very abundant in well defined localities, and entirely absent in an adjoining region, my notes may not be without value in pointing out the possibility of *irregular distribution.*

It is strange that during many years collecting at Poway and vicinity that S. pacificus and S. arizonæ should have escaped my notice, while S. sculptilis and A. pinguis were abundant; and that during the past season I should fail to obtain the two latter species in the San Diego River region, where the former species were plentiful. Granting the possibility of *regular distribution*

or error in observation, the question would then be explicable either upon the hypothesis of unfavorable conditions for the maintenance of the species in certain localities at certain periods from deficient food, epidemics, or preponderance of natural enemies; or, in the case of error, time for the correction of the same.

As any one of the causes mentioned is competent to account for the absence of the species from the localities, I shall have to rely upon time to point out the *vera causæ*—be it the natural distribution, absence of proper food, epidemics, influence of natural enemies, or error in observation.

The larvæ of any of the species enumerated are unknown to me. Pupæ of S. sculptilis have been observed, but unfortunately I neglected to preserve any of the specimens. In color they were milky white, elongate and but slightly curved. They pass through their transformations in the soil, near the surface. I have not observed any cocoon more than the cavity formed in the soft leaf-mould, beneath the prostrate plants and decaying debris along water-courses. *Frank E. Blaisdell.*

CORONADO, February 16, 1891.

THE MORNING GLORY BUSH, IPOMÆA LEPTOPHYLLA.

What brilliantly flowered shrubs! How beautiful! Great masses of them, here and there, glorify the early morning of the Colorado plains. The landscape for miles is, in some places, beautified by these large mounds of crimson flowers amid their bright green leaves.

It is indeed a morning glory that does not twine; but, instead, grows in large shrubby clumps three or four feet in diameter and almost as tall as broad. However, it is an herb and not a shrub; for in winter no trace of it is to be found above ground, except perhaps the dry and withered twigs of the previous summer. Underground, its dimensions are enormous; for it has an immense roundish root that stores up sufficient nourishment so as to enable the plant to make a growth in early summer rivalling that of Jack's famous bean stalk.

The flowers are numerous and larger than an ordinary morning glory; the leaves are long and narrow, glistening in the sunlight. Certainly the plant would well repay cultivation and seems especially adapted to the open lawn where a single plant when well grown would take the place of a whole bed of flowers.

Alice Eastwood.

GEM ARROW POINTS

(From the *Great Divide*, March, 1890.)

Nearly everyone is more or less familiar with the common flint arrow and spear heads turned up by the plow or dug from the mounds of the ancient red men or aborigines of America; but

comparatively few are acquainted with the tiny arrow heads of certain localities of the west. Thousands of farmers' boys have gathered the flint forms from the soil of the farms over which they roamed, but the little semi-precious stone points are seen in the east only as purchases from some western collector. For delicacy of point and barb, perfection of workmanship and beauty of material, few of the flints compare favorably with these chalcedony, agate, jasper and obsidian gems of the west. Archæologists well versed in the study of this science profess to tell us the manner in which these stone instruments were made. Of all the weapons made from stone these delicately formed arrows have created in my mind more grave doubts regarding the correctness of some of the advanced theories of the great students of American archæology than all of the coarser material that has come under my observation.

I have seen hundreds of Oregon gem arrow points so delicately constructed that they seemed to preclude the idea that they could have been struck the gentlest blow with any chipping tool of stone, antler, or what not, and have preserved the sharp and slender points and barbs that gave them uniqueness or variety. I am more and more impressed with the thought that the mode of making these small arrow heads is a lost art. None of the oldest Indians of the western coast can give any information upon the subject.

The most noted localities for these small arrow points are Oregon, Washington, New Mexico and Nevada. A few small points are occasionally found in Arizona, Colorado and Montana. A greater number have been found upon the east bank of the Willamette river, Oregon, from one-half mile above to one-half mile below the falls of the same name, upon an area of about five acres—one acre being at the south extreme and the other four acres at the north extreme of this one mile of river bank.

From the vast quantity of flakings found upon the former area we are led to the conclusion that the Indians had 'ancient arrow makers' stationed there. The favorite dwelling places of the red men were on the rivers near their mouths, or where natural obstructions made good fishing points. It is estimated by an old collector who has personally collected 35,000 of these gem arrow heads and purchased nearly as many more since 1878, that 20,000 have been gathered from the one-acre spot and over 100,000 from the four acres of ground above mentioned. At the latter place is found a stratum of dark soil two and a half feet in thickness, composed of charcoal animal bones, fresh water clams, shells, etc. Above the dark stratum is a layer of wash sand two feet thick, indicating one or more higher floods than we have any record of. From these facts, and from the fact that there is nothing on the ground to indicate a burial place, I draw the conclusion that a very ancient village of these aborigines existed here and remained a long time. The tribes living near the locality in

question are said to have been the Molalla, Clackamas and Klamath Indians.

What may seem stranger still, the fine material from which these arrows were made does not exist at or near the site of this village. Excepting petrified and agatized wood, the stones to make these arrow points were brought a considerable distance, and obsidian is not found nearer than 325 miles distant. Few large points worthy the name of spear are found here. The majority of arrow heads found are of the little, delicate points. The most prolific successes of the arrow seekers have been in the spring when the freshets have washed the sand loose upon the overflowed banks of the Willamette and upon recedence left in sight many new prizes to gladden the eye of the relic hunter.

L. W. Stilwell.

BRODIÆAS.

(From *Garden and Forest*, III, 636.)

The range of this genus is almost as wide as that of Calochortus. California has most of the species; Oregon, Nevada and Utah have some representatives; northern California is the home of the greater number. A few of the Brodiæas are sometimes found in sandy soil. B. terrestris always is, B. ixioides occasionally and B. laxa in depauperate specimens. I have also received bulbs of some Brodiæas unknown to me from the Sage-brush sand of Nevada and Utah. B. capitata and Brevortia coccinea luxuriate in the debris of loose rock and mould on the hill-sides, and the remaining species are natives of clay soils from light to heavy; B. stellaris, B. congesta, B. multiflora in lighter, and B. grandiflora, B. minor, B. laxa, B. ixioides and B. lactea on rich clay or wash soils. B. peduncularis is found in the sand and mould in the beds and along the sides of living streams. All Brodiæas are lovers of water, while the last named species grows in situations where water is standing or dropping continually during the winter. The finest growth of B. grandiflora or B. ixioides I have ever seen was where winter streams broke over ledges of large loose rocks. The bulbs were in the rich mould in the interstices and catches, and subject to a drip of water until the blooming season, and after that became dry. On the sunny sides of the deep precipitous cañons, where the loose soil rock and leaves have slid down to the bottom of the slope, often growing on low underbrush, which its flower-stalks overtop, B. coccinea, the Vegetable Fire Cracker, grows most luxuriantly. In such situations stalks five feet high, and bearing from fifteen to thirty blossoms, are not unusual. B. capitata delights in similar soil, but in a sunny exposure. Stropholirion californicum, or B. volubilis, a singular species in which the flower-stalks twine around any supporting object, delights in a soil like that suited to B. capitata in underbrush.

So much for natural conditions. I have perfect success with

Brodiæas in shallow boxes, the same as described for Calochortus. For a covering I use clay and chip soil. With B. grandiflora, B. capitata, B. coccinea and B. stellaris rich soil scraped from a wood-yard proves excellent covering. With others clay loam, with various mixtures, with chip soil, have been tried, and the bulbs thrive in all of them. In boxes one will hardly use too much water until the blooming season, when moderate moisture only is required, after which the plants should be dried off. They should be planted shallow—four inches is deep enough—and they need abundant sunlight. Here all are perfectly hardy, and I am satisfied that with slight winter protection they will prove so in the Eastern States. *Carl Purdy.*

THE YELLOW-HAIRED PORCUPINE.

A very large and fine specimen of Erethizon epizanthus, one of some eight or ten individuals which have been taken in Lane county, Oregon, during the past decade, has recently been brought to me for preparation. The animal was covered on the upper parts and sides with a dense growth of short spines, becoming thinner and merging through thickened spinous hairs to coarse bristles on the sides, and especially on the inferior caudal surface. On the under portions of the limbs, as well as the medial portion of the belly and the muzzle there were no spines.

Under fur rather soft, dark sooty-brown, almost concealed by the spines and bristles, which latter are in some parts six or even eight inches long. The bristles in this specimen seem to differ from Brandt's type by being penultimately tipped instead of extremely tipped with greenish yellow, the yellow in this individual being displaced at the tips by the prevailing color of dark brown in nearly all the bristles. The spines are greenish yellow tipped with dark brown. Brandt described the extreme bases of the bristles as yellowish, while in this specimen the yellow extended at least one-fourth the entire length of the spines, or in some of them two inches from the base.

This porcupine lives in burrows formed in the ground by itself, is nocturnal in habits, and strctly herbivorous, the teeth being admirably formed for a vegetable diet. Formula of the teeth: incisors, $\frac{1-1}{1-1}$; molars, $\frac{4-4}{4-4}=20$.

They are reputed to be quite destructive in gardens in some places, but are too few in numbers in this region probably to become greatly noted in this particular. The ruthless war waged upon them by man—almost their only foe after reaching maturity—reduces their number every year. *Aurelius Todd.*

Miss Alice Eastwood, of Denver, Colorado, the present Secretary of the Colorado Biological Association, has been extending her acquaintance with flowers by a botanical excursion through southern California.

C. LUTEUS *Dougl.* Plant low, with clear lemon yellow flowers.

C. MACROCARPUS *Dougl.* Stout and tall, the lilac flowers banded with purple.

C. NUTTALLII *T. & G.* Tall, flowers large, of a creamy whiteness, banded with green on the back of the petals. A strong growing plant.

C. LEICHTLINII *Hook.* A low mountain form of the last.

C. PALMERI *Watson.* Rose purple flowers, with maroon purple spots at base of petals.*

C SPLENDENS *Dougl.* Lustrous rose purple, with often a maroon purple spot at base of petal*. Greatly admired.

C. VENUSTUS *Benth.* Regarding this species, considerable confusion exists relative to the nomenclature of the numerous beautiful varieties. The following are the leading varieties known in cultivation, the first being considered the type of the species.

1—Roseus. Creamy white inside, with rose-colored blotch at top of petal, a beautiful tinted eye in center, and silky gland at base; rich carmine on back. A perfect gem.

2—Citrinus. Citron yellow.

3—Oculatus. White inside, with richly colored eye-like spots.

4—Purpurascens. Rich purplish lilac, with eye-like spots.

C. WEEDII *Wood.* This is one of the finest of the Mariposa Tulips, two or three feet high, producing several large and brilliant orange yellow flowers, delicately dotted with brown and covered with silky hairs. Peculiar to Southern California.

II.—STAR TULIPS.

The Celestial or Star Tulips differ from the Mariposa Tulips in the slender drooping stems, bearing many bell-shaped or globular flowers. A single long glossy leaf is characteristic of both sections of the genus.

C. ALBUS *Dougl.* A strong growing plant, with pearly white globular flowers. often an inch in diameter, lined with silky hairs. Very beautiful.

C. BENTHAMII *Baker.* Bearing two to six delicate nearly erect open bells, yellow, lined with silky hairs.

C. FLEXUOSUS *Watson.* Petals clear lilac.

C. LILACINUS *Kell.* Erect cup-shaped flowers, light lilac.

C. MAWEANUS *Leichtlin.* Delicate open bells, white lined with silky blue hairs.

C. NITIDUS *Dougl.* A foot high, white or purplish flowers.

C. NUDUS *Watson.* Low and often slender, white or pale lilac. wholly without hairs

C. PULCHELLUS *Dougl.* One of the hardiest and most beautiful species, resembling C. albus, but with rich yellow flowers.

C. UNIFLORUS *H. & A.* Large white flowers.

CALYCANTHUS.

C. OCCIDENTALIS *H. & A.* Sweet-scented shrub. An erect shrub, ten feet high, dark green foliage and purplish-red or white flowers. Deciduous.

CAMASSIA.

The Camass furnished to the Californian aborigine one of his most valued articles of food, and to the white man it contributes a handsome flower. The Camassias are perfectly hardy in the eastern states. They thrive best in a porous soil.

C. CUSICKII *Watson.* The flowers of this species, borne in a long raceme, when first expanded are white, changing to pale blue after they have been open a few days. Nearly a yard high at maturity; bulbs large. 'Finest of the genus.'

C. ESCULENTA *Lindl.* The Indian Kamass grows from ten to twenty inches high, has long grass-like leaves, and bears a loose spike of violet-blue flowers, five inches long. The flowers are an inch or more wide, ten to twenty in a spike, and useful for cutting.

CARPENTERIA.

C. CALIFORNICA *Torrey.* An ornamental shrub related to the syringa, with fragrant white flowers.

CASTILLEIA.

C. AFFINIS *H. & A.* Painter's brush. A stout annual one to three feet high, abundant along moist banks of streams in Southern California, where the yellowish flowers tipped with red, in a leafy spike, and with bright red floral bracts, renders the plant very striking and conspicuous.

C. FOLIOLOSA *H. & A.* A perennial, one or two feet high, shrubby at base, clothed with a matted white wool. The inconspicuous yellowish or red tipped flowers outshone by the brilliant red of the floral bracts. Flourishes on dry hillsides.

CEANOTHUS.

The Wild Lilacs of the Pacific Coast are in endless variety. They are mostly graceful evergreen shrubs or small trees, bearing dense showy racemes of either blue or white flowers.

C. HIRSUTUS *Nuttall.* This is one of the most graceful of our Californian shrubs, with glossy foliage and bearing a profusion of campanula-blue flowers which fade to flax-flower and pearl blue.*

C. DIVARICATUS *Nutt.* Pale glaucous leaves, and light blue to white flowers. Very ornamental.

C. INTEGERRIMUS *H. & A.* Bears large open terminal racemes of white fragrant flowers.

C. ORCUTTII *Parry.* Flowers unknown. Native of the high mountains, of San Diego county.

C. THYRSIFLORUS *Esch.* Sometimes a small tree, with bright blue flowers. One of the best known in cultivation.

CEREUS.

Cereus includes over 200 species of the most beautiful cacti, the most of them producing an abundance of brilliant colored or exquisitely tinted flowers. Some are delicate trailing plants, others are erect and rigid, in the giant cactus attaining a height of sixty feet. Many of the species are beautiful and curious in themselves, not needing to blossom to repay the attention bestowed upon them.

C. EMORYI *Engelm.* The Velvet Cactus is a cylindrical species covered with slender yellow spines, when young so soft and flexible as to suggest its popular name. The flowers are greenish yellow, not showy. In the United States only found near San Diego.

C. ENGELMANNI *Parry.* One of the most beautiful of the Cushion Cacti, with long white or rich brown spines, growing in clusters of few to many cylindrical heads a few inches tall, and bearing numerous large and bright magenta colored flowers. The fruit is edible, an inch in diameter, possessing the flavor of the strawberry.

C. GIGANTEUS *Engelm.* The Giant Cactus is the largest species known. Attains to a height of sixty feet, bearing large flowers and edible fruit.

CHAENACTIS.

C. ARTEMISIAEFOLIA *Grav.* A viscid-pubescent annual, one to five feet tall, bushy, with white or flesh-colored heads of composite flowers, an inch in diameter.

C. TENUIFOLIA *Nuttall.* An erect or decumbent annual, a span to a foot high with composite heads of flowers an inch across, of a lemon yellow approaching orange in the center.* A coarse but rather showy plant, like the preceding, remaining long in flower.

CHAMAECYPARIS.

C. LAWSONIANA *Parlat.* The Lawson Cypress is one of the most beautiful of the many native trees of the Pacific Coast, and is highly valued for its ornamental qualities. It sometimes attain a height of 150 feet.

CHILOPSIS.

C. SALIGNA *Don.* The Desert Willow is a graceful willow-like shrub, related to the Catalpa, with showy white flowers two inches long, veined with purple.

CHLOROGALUM.

C. ANGUSTIFOLIUM *Kellogg.* Flowers white with yellowish-green lines.

C. PARVIFLORUM *Watson.* Flowering stems from six inches to six feet tall. Flowers not showy.

C POMERIDIANUM *Kunth.* The common Soap plant or *Amole* produces a large, spreading panicle of rather inconspicuous white purplish-veined flowers from an immense fibrous-coated bulb which is sometimes used as a substitute for soap.

CLARKIA.

C. ELEGANS *Dougl.* A showy, profuse flowering annual, six inches to several feet high, of rich purple and other colors. The following varieties have been produced by cultivation.

1—Alba. With pure white flowers.
2—Alba flore pleno. Double white flowers.
3—Rosea. Rose-colored flowers.
4—Rosea flore pleno. Double rose-colored flowers.

CLAYTONIA.

C. PERFOLIATA *Don.* A succulent annual, with small white or rose-colored flowers. In England it is considered very fine for salad, while in California it is known as Spanish Lettuce.

COBAEA.

C. SCANDENS *Cav.* A Mexican climber of the phlox family, highly valued as a rapid grower and for its large bell-shaped flowers, of an apple green color when first opened, changing to lavender and violet and finally to a rich prune purple.* A tall climber.

COLLINSIA

Tender annuals, commonly two-colored in their wild state, very pretty.

C. BARTSIAEFOLIA *Benth.* Purplish or pale violet flowers.

C. BARTSIAEFOLIA ALBA. A cultivated white variety, rarely found wild.

C. BICOLOR *Benth.* The most showy species, with purple and white flowers, three-quarters of an inch long, in large whorls. The following are the leading cultivated varieties.

1.—Alba. Lovely white whorls.
2.—Atrorubens. A pretty purplish-red variety.
3.—Candidissima. A very pretty dwarf white form.
4.—Carnea.
5.—Rosea.

COLLOMIA.

C. GRANDIFLORA *Dougl.* An erect annual related to the Gilias, a foot or two high with large showy salmon-colored flowers.

CUPRESSUS.

The California species of Cypress are among the most widely planted of evergreen trees or shrubs, and are very ornamental. The Monterey Cypress is especially useful for hedges. (The Lawson Cypress belongs to the genus Chamaecyparis.)

C. GOVENIANA *Gordan.* Usually a low bushy shrub or tree.

C. GUADALUPENSIS *Watson.* The Blue Cypress is one of the most ornamental species in the genus. Tall and graceful with fine glaucous foliage, and of a dense compact growth.

C. MACNABIANA *Murr.* A graceful little tree, rarely over ten feet high.

C. MACROCARPA *Hartw.* The Monterey Cypress. Said to resemble the Cedar of Lebanon in habit, with dense far-spreading branches.

DARLINGTONIA.

DARLINGTONIA.

D. CALIFORNICA *Torrey.* A striking perennial plant of curious aspect. Of greenish yellow hue, bearing a nodding purplish flower. One of the Pitcher plants, noted for its alluring insects to their destruction.

DATURA.

D. METELOIDES *DC.* A rank growing plant, with large white flowers delicately shaded with violet. Very handsome in cultivation, but a common weed in California.

DELPHINIUM.

The larkspurs scarcely need an introduction, so many species having met with kindly reception. California, however, has the honor of having contributed several of the finest species yet introduced into general cultivation.

D. CARDINALE *Hook.* A stout perennial, five to seven feet tall, producing magnificent panicles of bright, handsome scarlet flowers with a yellowish center. Quite hardy.

D. DECORUM *F. & M.* A foot high, with a long spike of brilliant indigo blue flowers. Very fine.

D. NUDICAULE *T. & G.* Flowers in spikes a foot long, light scarlet to crimson.

DICENTRA.

Glabrous perennials, usually showy, with pinnately divided leaves and racemes or panicles of brilliant flowers.

D. CHRYSANTHA *H. & A.* A most generous plant, continuously in bloom from May until October. The small rich lemon yellow* flowers borne in a terminal panicle a foot or two long; the plant two to four feet high, very effective for grouping in borders; the finely divided foliage resembling some ferns, of a very pale bluish-green and very beautiful. Roots easily transplanted in the fall or winter, or the plant may be grown from seed. Grows wild on dry hills, but thrives in rich garden soil.

DODECATHEON.

The Giant Cyclamen, Dodecatheon Clevelandi, is one of the most charming of the many lovely spring flowers of Southern California. Every child in springtime is sure to gather large handfuls of the fragrant flowers, and each has some pretty name for them such as Rabbit-ears, Shooting-stars, or Mad Violets. The flowering stem is usually a foot high, bearing an umbel of six to twenty-five of the large brilliant flowers. The center of the flower is of a rich prune purple bordered with bright lemon yellow, the reflexed divisions of the corolla pure white or tipped with lavender or phlox purple. Several varieties have been introduced as follows.

D. CLEVELANDI *Greene.* As above described, with lavender colored divisions of the corolla. The varieties:

1—Alba. Divisions of a pure white.

2—Splendens. Divisions of a deep brilliant phlox purple.

ECHINOCACTUS.

This genus includes over 200 species of depressed-globose or cylindrical cacti, some of very large size. They are remarkable for their beauty and symmetry of growth, armed with strong spines as a rule.

E. CYLINDRACEUS *Engelm.* Noted for its beautiful flexuous spines, frequently of an ivory whiteness. I have measured one plant that exceeded ten feet in height, and nearly two feet in diameter. Usually under three feet high. Flowers two inches across, of a clear lemon yellow.*

E. EMORYI *Engelm.* Dull red spines and flowers.

E. LECONTEI *Engelm.* Spines of a silvery grey color usually.

E. POLYCEPHALUS *Engelm.* A rare desert species. Very distinct from all others.

E. ORCUTTII *Engelm.* A fine cylindrical form found in Lower California.

E. VIRIDESCENS *Nutt.* A depressed-globose plant, common near San Diego. Known as the Turk's head cactus.

E. WISLIZENI *Engelm.* The Giant Fish-hook cactus; the typical form occurs in New Mexico.

ERYTHEA.

A genus of beautiful palms peculiar to California, related to the genus Brahea, with which it has been sometimes included. The leaves are fan-shaped, without filaments. The fruit is edible, with seeds as large as marbles.

E. ARMATA *Watson.* The Blue palm, with bluish-white leaves for which it ranks high among the ornamental palms.

E. EDULIS *Watson.* A larger tree, of more rapid growth, and foliage of a dark green. Considered one of the most desirable of palms.

ERYTHRAEA.

The Canchalaguas are elegant annuals, a span to a foot high, producing a multitude of bright flowers. The following is the largest and handsomest species in the genus.

E. VENUSTA *Gray.* Flowers an inch across, rotate, with slender tube forming a center of delicate sulphur yellow, the usually five divisions of the corolla of a deep solferino, more rarely lavender or white.* Foliage and stems of light apple green.

ERYTHRONIUM.

The Dog-tooth Violets are distinctively American, with the exception of a single species that is a native of Europe and Asia. The greatest variety of forms thrive in their nativity on the Pacific Coast. They are beautiful lily-like flowers, highly prized in cultivation. They grow in shady places in rock and leaf mold as a rule. The following are the names by which the principal varieties are known in cultivation.

E. CITRINUM. A variety from Oregon.

E. GRANDIFLORUM. The leaves are broad and richly mottled in brown, green and white, with delicate straw-colored flowers, recurved like a lily.

E. GRANDIFLORUM ALBIFLORUM. This sends up from long, narrow corms, broad leaves, conspicuously blotched with purple, and tall, slender racemes of two to six nodding, lily-like, long-pedicelled flowers, which, when fully expanded, are nearly three inches across. The segments are pale yellow, dashed with orange towards the base, with darker orange spots on the interior face.

E. GIGANTEUM. Flowers pure white. Considerable confusion exists in the nomenclature of these plants, which only careful comparisons can straighten. This, E. albiflorum and E. Smithii, are all mere varieties of E. grandiflorum doubtless, and probably indistinguishable from the above variety.

E. HENDERSONI. Described as the handsomest species of the genus, with bright and strongly colored flowers which are very striking and attractive in their beauty. The petals have a very dark purple and somewhat blotched center, which is surrounded by a band of yellow, and beyond this they are pale purple.

E. HOWELLII. Light cream-colored flowers slightly tinged with red, with a yellow center. Discovered in Oregon by Mr. Thomas Howell, for whom it is named. An interesting species that has been found to thrive in New England in a loamy soil in open sunlight.

E. SMITHII. Flowers described as pure white on opening, often changing to purple.

ESCHSCHOLTZIA.

The Golden Eschscholtzia has aided in no small degree in making California famous as a land of sunny flowers, and has very fitly been selected as the state flower of California. In its wild state it often covers thousands of acres of hill or plain with its intensely brilliant and richly colored flowers, which in the bright sunlight are perfectly dazzling. Some botanists recognize more than a dozen species in this genus. The leading varieties in cultivation are known under the following names.

E. CALIFORNICA *Cham.* Flowers large, varying from deep orange to sulphur yellow or even white. The horticultural varieties are:—

1.—Alba. Pure white.

2.—Alba flore pleno. Double white. Very choice and beautiful.

3.—Aurantiaca.

4.—Compacta.

5.—Crocea. Bright yellow.

6.—Crocea flore pleno. Double yellow, new.

7.—Crocea striata.

8.—Dentata aurantiaca.

9.—Dentata sulphurea.

10.—Mandarin. Described as a new and very beautiful variety, of a rich orange or crimson backed with brilliant mandarin scarlet.

11.—Rosea. Very delicate rose color.

12.—Rosea flore pleno.

13.—Rose Cardinal. Bright rose to deep carmine, very pretty and remaining in bloom a long time.

14.—Tenuifolia.

EUCALYPTUS.

The Australian Gum trees are so thoroughly at home in California, and so extensively grown, as to almost be considered characteristic of the state. The more popular species are the following.

E. AMYGDALINA. The Giant Gum.

E. CORYNOCALYX *Mueller.* The Sugar Gum.

E. GLOBULUS *La Billardiere.* The Blue Gum, which is more extensively planted than all the others together.

E. LEUCOXYLON *Mueller.* The Iron-bark tree.

E. ROSTRATA *Schl.* The Red Gum, now coming into general favor.

FOUQUIERA.

F. SPLENDENS *Engelm.* The Candlewood, or *Hocotillo* of the Mexicans, is a curious, cactus-like plant, five to ten feet high, bearing terminal spikes or racemes of flaming scarlet flowers. It is characteristic of the desert regions, where it blossoms out whenever a shower occurs.

FRASERA.

F. PARRYI *Torrey*. A curious biennial, with a rotate 4-parted white corolla, dotted minutely with prune purple, and with an apple green spot on each division * Flowers nearly an inch across, in a panicle borne on a stout stem one to four feet high.

FRAXINUS.

F. DIPETALA *H. & A.* Flowering Ash, a small shrub found in Lower California, producing in springtime a profusion of lovely white or flesh-colored flowers. A very ornamental shrub.

FREMONTIA.

A beautiful hardy deciduous shrub or small tree, named in honor of the late Gen. Fremont; bearing conspicuous bright yellow flowers, one to three inches across. But a single species in the genus.

F. CALIFORNICA *Torr.* Of graceful and symmetrical growth and greatly prized for its beauty. Thrives in a sandy loam.

FRITILLARIA.

The Fritillarias are all elegant in habit and among the most beautiful of the many members of the lily family. They have broad base leaves and strong leafy stems, bearing from a few to many flowers, like a spray of bells. The Crown Imperial and many other ornamental plants belong to the genus. The bulbs are light and easily sent by mail, and almost rival their flowers in beauty.

F. ATROPURPUREA *Nutt.* A foot high, growing in dry mountain soils, with dark purple, bell-shaped pendant flowers.

F. BIFLORA *Lindl.* The Chocolate Lily, as it is called by many of its younger admirers, is one of the finest species in a large genus of stately and handsome flowers. The strong leafy stem from a few inches to a foot tall, bearing from one to five large and beautiful deep claret brown campanulate flowers,* in a graceful cluster. Flower an inch long, slightly mottled with green.

F. LANCEOLATA *Pursh* A tall stately plant with curiously mottled greenish-yellow flowers.

F. LILIACEA *Lindl.* A beautiful low-growing plant with white flowers.

F. PUDICA *Sprengel.* Of low dwarf habit, four to five inches tall, with yellow flowers. Early spring.

F. RECURVA *Benth.* A graceful plant, from eight inches to two feet in height, with crimson or scarlet flowers, brilliant and of long duration, useful for cutting. One of the most attractive of Pacific Coast plants, blooms early in cultivation and is readily grown in a light, loamy soil.

GILIA.

Handsome, low growing, profuse blooming annuals, well known to every cultivator of flowers. The genus is peculiar to West America with a few exceptions. A few species perennial but not yet known in cultivation. The numerous varieties in cultivation mostly originated in California, of which the following are best known.

G. ACHILLEAEFOLIA *Benth.* Light blue clusters of flowers.

G. ACHILLEAEFOLIA ALBA. White variety.

G. BICOLOR.

G. CAPITATA *Dougl.* Delicate blue, in dense clusters.

G. CAPITATA ALBA. White variety.

G. CAPITATA MAJOR.

GILIA DIANTHOIDES.

G. DIANTHOIDES *Endl* One of the most charming of Californian annuals, producing a profusion of brilliant rose-pink flowers which completely smother the little plant with loveliness. Flowers large, with a light yellow center Plant seldom exceeds three inches in height, but forms a broad mat. A perfect gem

G. DIANTHOIDES ALBA A choice white variety of surpassing beauty.

G. LACINIATA.

G. LINIFLORA *Benth.* A finely branching plant, a foot or two high, with large white or pale blue flowers.

G. MINIMA CAERULEA. A dwarf form with lovely blue flowers

G. NIVALIS.

G. TRICOLOR *Benth.* Familiar in cultivation, with several horticultural varieties as follows:

1—Alba.
2—Rosea—splendens.
3—Rubro—violacea.

GODETIA.

G. QUADRIVULNERA *Spach.* A slender annual, with either white or bright phlox-purple flowers, quite showy, a foot or two high.

GREVILLEA.

G. ROBUSTA *Cunningham.* A beautiful tree for the lawn or street, indigenous to eastern Australia, but now extensively planted in California for its beauty. Of rapid growth and resisting drought in a remarkable degree. Grows to a height of 150 feet.

HESPEROCALLIS.

The Day Lily of the Desert is one of the most beautiful and characteristic plants of the desert regions of California. The

large edible bulb produces one or more flower stems which rise from one to two feet above the sand in which they grow, bearing from a few to thirty white fragrant flowers. A single species, H. undulata.

HETEROMELES.

H. ARBUTIFOLIA *Roemer.* The California Holly, or Christmas berry, is a handsome dark evergreen shrub, with white flowers and producing clusters of bright scarlet berries, which ripen at Christmas time.

JUNIPERUS.

J. CALIFORNICA *Carr.* Californian Juniper. A small shrub of ornamental value, common in Southern California.

J. OCCIDENTALIS *Hook.* These two are very similar in aspect.

LASTHENIA.

L. GLABRATA *Lindl.* A composite plant, a span to a foot high, producing a multitude of showy yellow flowers. Annual.

LATHYRUS.

L. SPLENDENS *Kellogg.* 'The Pride of California.' A splendid hardy perennial, producing a profusion of its large, brilliant rose red to crimson blossoms,* in clusters of ten or more. The most magnificent of the native climbing plants of West America.

L. VENOSUS *Muhl.* The flowers of this perennial pea are but a little smaller or less beautiful than the last, of a deep magenta. It has often been mistaken for L. splendens, but if once seen together they can always be recognized.

L. VESTITUS *Nutt.* Lovely white flowers, veined with rose.

LAYIA.

This genus was named in honor of Thomas Lay, the naturalist in Beechey's voyage. They are hardy annuals, thriving in any ordinary soil.

L. ELEGANS *T. & G.* The California Layia is a beautiful upright bushy plant, about a foot high, and producing in abundance brilliant lemon yellow* single flowers, two inches across, the tips of the rays forming often a scolloped white border. Showy.

LEPTOSYNE.

L. DOUGLASII *DC.* Easily mistaken for Layia elegans by those who are not botanists. Equally pretty but more modest and retiring.

L. MARITIMA *Gray.* A striking and showy plant, perennial, the succulent stems a foot or two high, producing large yellow flowers of great beauty, in abundance. Common on ocean beaches.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

SAN FRANCISCO MICROSCOPICAL SOCIETY.

DECEMBER 17TH, 1890.

The regular meeting was held at its rooms, 130 Sutter street, with President Wickson in the chair. Besides a good attendance of members, a number of visitors was present.

After the usual routine business had been transacted, the President announced that the lecture of the evening would be by C. H. Eigenmann, Ph. D., on "The Embryology of Viviparous Fishes."

The speaker began by informing his hearers that the waters of the California Coast abounded in viviparous fishes, the perch and the rock cod being well-known representatives of that class. His investigations had been confined to fishes near the shore, where the depth did not exceed one hundred fathoms; but the deep-sea species examined by the naturalists of the Albatross showed the same preponderance of the viviparous class.

The specimens of fishes shown last night were the common "shiner" of our bay, the Micrometrus aggregatus of scientists. Every stage of development was shown, either by careful prepared and stained sections of the embryo, or by dissections of the matured forms. The eggs of Micrometrus are the smallest fish ova yet described, measuring only a little over one one-hundred-and-fortieth of an inch, or less than those of most mamalia. The average pelegic fish egg has a diameter of one milimeter, or one-thirty-second of an inch, only a very minute portion of which segments and takes part in the formation of the embryo. The egg is deposited by the mother in the water, where it lies or swims unprotected. As the tail of the young fish is formed it begins to move, first feebly and then vigorously, until the membrane surrounding the egg is burst and the young fish swims out.

The development of Micrometrus differs from the usual mode in some very essential particulars, as this form belongs to a family of viivparous fishes almost exclusively confined to the west coast of North America. All the members of this family give birth to their young in an advanced stage. At the time the eggs are ripe the ovary is no thicker than a goose-quill, and the oviferous tissues are folded upon themselves. With the growth of the embryos the walls of the ovary become greatly distended, the oviferous sheets unfolding at the same time. In Micrometrus the active period begins when the eggs are ripe, and culminates at the time the young are set free. In other words, the eggs become ripe when in ordinary fishes they only begin their most active growth.

Dr. Eigenmann illustrated his lecture with drawings at the black-board, and also by very carefully made drawings in India ink. The latter were made with the camera lucida, and consequently were all drawn to scale. The speaker's remarks were received with marked satisfaction by those present, and he

received a vote of thanks. His investigation in the life-history and generic peculiarities of Pacific Coast fishes has been the means of adding many new facts to science.

JANUARY 21ST, 1891.

The regular fortnightly meeting was held at its rooms with President Wickson in the Chair. There were present in addition to a fair attendance of members, Professor Davidson, an honary member, and Charles W. Smiley, of Washington, D.C., editor of *The American Monthly Microscopical Journal.*

After the reading of the minutes and the usual routine business a general discussion was had on the motion to amend the constitution of the society, reducing the initiation fee from $20 to $5. The sentiment was pretty evenly divided, for and against the motion, but by a bare majority further consideration was postponed for one month.

Some interesting and valuable additions to the society's cabinet were received. Through Henry G. Hanks, John A. Edman, of Meadow Valley, Plumas county, Cal., presented two slides of amalgam crystals, which were both interesting and beautiful. They are original gold crystals, before being carefully treated with cold, strong nitric acid, and have a good deal of free mercury adhering which can only be abstracted by contact with bright gold or silver In this case, the donor writes, the amalgam crystals are likely to adhere to the metal so as to break when dislodged. At a temperature a little over 70° Fahr. the crystals begin to deliquesce, and become fluid at about 100°.

Colonel C. Mason Kinne donated to the cabinet a small quantity of fresh-water diatomaceous earth he had received from Dr. Arthur M. Edwards, Newark, N. J. Accompanying the specimens there was a note from Dr. Edwards, stating that the deposit was discovered recently at Waverly, N. J. It is interesting as being the first discovered which places the diatoms below the recent and on the glacial deposit. This bed was found last June and is fully eight feet below a deposit of marine diatoms. The discoverer calls it an intra-glacial deposit. The President gave a portion to Mr. Riedy, with the request that he work it up and report at an early meeting of the society.

WILLIAM E. LOY, Rec. Sec.

EDITORIAL.

A timely article is presented to our readers this month by Prof. F. L. Washburn on laboratory work in school and college, which educators will do well to read.

The orange, the cultivation of which is one of the most important industries in southern California, is a subject which we believe all our readers, east or west, will enjoy learning about. One method of propagating this tree is omitted in the article presented this month, that of growing from the *leaves!* The propa-

gation of trees and plants from leaves alone is an interesting subject on which we invite correspondence.

It is the aim of this magazine to present something of interest each month to as many classes of readers as possible. We number among our patrons geologists, botanists, zoologists, and those interested in floriculture and practical horticulture, but we are obliged to omit or but slightly touch upon subjects of great importance, to some of our readers at least, through lack of space. Thirty-two pages will not begin to hold all that we would—but there is always room for the *best.*

NOTES AND NEWS.

G. W. Wright, Karanaghope Rd., Auckland, New Zealand, desires to exchange New Zealand for American shells, and invites correspondence.

Miss Ida M. Shepard, of Long Beach, California, has been making extensive collections of San Diego shells this winter, and intends collecting on the coast of Lower California.

A specimen of diatomaceous earth from the ocean beach near San Diego found by C. R. Orcutt some years ago, has been examined by Clarence Lown. It was very like some samples of the Redondo Beach deposit, and may have been washed from there. The sample contained some of the rarer species of diatoms, and was particularly rich in Aulisci.

The asbestos mines of Skagit county, Oregon, produce a superior quality of asbestos, and the output is rapidly increasing. Large quantities are being shipped to Portland and Tacoma.

LIBRARY CATALOGUE.

(Scientific books and periodicals may be ordered through our Book and Subscription Department.)

Recent accessions to the Library of the West American Museum of Nature and Art will be catalogued monthly.

4063. Catalogue of the land and freshwater mollusca of the British Isles, with all the named varieties. By T. D. A. Cockerell. From the author.

4064. U. S. Board on Geographic names. Bulletin No. 1, issued Dec. 31, 1890. Published by the Smithsonian Institution.

4065. Bull. of the Museum of Comparative Zoology, XX, No. 4. Cristatella: the origin and development of the individual in the colony. By C. B. Davenport. With eleven plates. November, 1890.

4066. The American Garden: an illustrated journal of horticulture. Edited by L. H. Bailey. Vol. XI, 1890. New York. The Rural Publishing Co. 780 pp., Royal 8vo,

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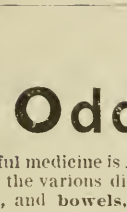

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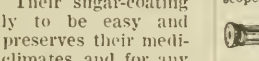

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